allocated to 1^{st} to 3^{rd} layers are respectively {0,6,3}, then cyclic shift values allocated to the 1^{st} to 3^{rd} layers may be respectively {0,6,3}.

[0132] In addition to the cyclic shift indicator, a selection offset can be additionally allocated in a DCI format. Starting from a cyclic shift value indicated by the cyclic shift indicator, cyclic shift values of reference signal sequences for a plurality layers can be allocated with an interval corresponding to a value indicated by the selection offset. The selection offset may have a length of 1 bit or two bits. If the selection offset has a length of 1, the selection offset may be any one of {1,2}, {1,3}, and {1,4}. If the selection offset has a length of 2, the selection offset may be any one of {1,2,3,4}. For example, if a cyclic shift indicator is 3 bits, a selection offset is 1 bit, a cyclic shift set consists of {0,2,3,4,6,8,9,10}, a cyclic shift indicator and a selection offset used by a 1^{st} user are respectively '000' and '0', and a cyclic shift indicator and a selection offset used by a 2^{nd} user are respectively '101' and '1', then cyclic shift values of reference signals of respective layers of the 1^{st} user may be {0,2}, and cyclic shift values of reference signals of respective layers of the 2^{nd} user may be {8,10}.

[0133] Meanwhile, if the number of layers is 3, two cyclic shift indicators can be allocated from the DCI format and thus can be used as cyclic shift values of reference signals of two layers, and a cyclic shift value of a reference signal of the remaining one layer can be allocated based on any one of the two cyclic shift indicators indicated by a PDCCH. In this case, the cyclic shift value of the reference signal of the remaining one layer can be implicitly determined based on a selection offset without additional signaling. Alternatively, the cyclic shift value of the reference signal of the remaining layer can be allocated based on any one of the two cyclic shift indicators.

[0134] The above description is also applied to a case where the number of layers is 4. Two cyclic shift indicators can be allocated from the DCI format and thus can be used as cyclic shift values of reference signals of two layers, and cyclic shift values of reference signals of the remaining two layers can be allocated based on the two cyclic shift indicators. For example, a cyclic shift value of a reference signal of a 3^{rd} layer can be based on a cyclic shift value of a reference signal of a 1^{st} layer, and a cyclic shift value of a reference signal of a 4^{th} layer can be based on a cyclic shift value of a reference signal of a 2^{nd} layer. The cyclic shift values of the reference signals of the remaining two layers can be implicitly determined based on a selection offset without additional signaling.

[0135] Although allocation of a cyclic shift value of an uplink DMRS has been described above by considering a plurality of layers, the present invention is not limited thereto, and thus can also apply to an uplink sounding reference signal. In this case, the present invention can apply specifically to an uplink sounding reference signal by varying a cyclic shift indicator allocated for the DMRS, and a cyclic shift set, etc. In addition, a signaling overhead can be prevented from occurring by directly applying the cyclic shift indicator for the DMRS or the cyclic shift value to the sounding reference signal.

[0136] Hereinafter, a method of allocating a cyclic shift value of a reference signal sequence of each layer by combining a cyclic shift index for indicating a cyclic shift value and an OCC index for indicating an OCC will be described. In this case, the cyclic shift value can be determined such that an interval of cyclic shift values of reference signals of respective layers is maximized. Alternatively, the cyclic shift value of the reference signals of the respective layers can be determined by using a cyclic shift indicator without additional signaling of the OCC index. In the following description, the cyclic shift index and the OCC index are described by using a table. In addition, although it is assumed that the number of layers is 4, when the number of layers is less than or equal to 4, it is also possible to use only cyclic shift values for some layers among cyclic shift values proposed in the corresponding table.

[0137] First, cyclic shift values can be allocated such that an interval of cyclic shift values of reference signals between 1^{st} and 2^{nd} layers and an interval of cyclic shift values of reference signals between 3^{rd} and 4^{th} layers are maximized. According to the applied OCC, only reference signals of the 1^{st} and 2^{nd} layers may remain and channel estimation may be performed in this state, and on the other hand, only reference signals of the 3^{rd} and 4^{th} layers may remain and channel estimation may be performed in this state.

[0138] Table 9 shows an example in which a cyclic shift index and an OCC index are mapped according to the proposed invention.

TABLE 9

Index i(cyclic shift)	Cyclic Shift Field in DCI format 0	$n_{DMRS}^{(2)}$	OCC index
0	000	0	0
1	001	6	0
2	010	3	1
3	011	4	1
4	100	2	0
5	101	8	0
6	110	10	1
7	111	9	1

[0139] According to Table 9, a cyclic shift index i and an OCC index are mapped. A cyclic shift field in DCI format 0 indicated by the cyclic shift index and $n_{DMRS}^{(2)}$ to be mapped to the cyclic shift field are mapped to the OCC index. That is, the same OCC index is always applied to the value $n_{DMRS}^{(2)}$. For example, if $n_{DMRS}^{(2)}=0$, the OCC index may be always 0, and if $n_{DMRS}^{(2)}=3$, the OCC index may be always 1. In this case, when the OCC index is 0, it implies that an OCC applied to 1^{st} and 2^{nd} slots are [11], and when the OCC is 1, it implies that an OCC applied to the 1^{st} and 2^{nd} slots are [1-1]. Alternatively, the opposite is also applicable.

[0140] Table 10 shows a cyclic shift value of a reference signal of each layer applied according to Table 9.

TABLE 10

Index i(cyclic shift)	Cyclic Shift Field in DCI format 0 [3]	$n_{DMRS}^{(2)}$	Cyclic shift value of RS for rank-1 index	Cyclic shift value of RS for rank-2 index	Cyclic shift value of RS for rank-3 index	Cyclic shift value of RS for rank-4 index
0	000	0	0	6	−3	−9
1	001	6	6	0	−9	−3
2	010	3	−3	−9	6	0
3	011	4	−4	−10	8	2
4	100	2	2	8	4	10